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**Subjects 471 (65, 542, 935)
(In reply, refer to Subject 471)**

**333 Pfingsten Road
Northbrook, IL 60062
June 20, 1997**

TO: Casualty Council of Underwriters Laboratories Inc.,
Consumer Advisory Council,
Electrical Council of Underwriters Laboratories Inc.,
Fire Council of Underwriters Laboratories Inc.,
Subscribers to UL's Standards Service for:
Commercial Refrigerators and Freezers
Fluorescent-Lamp Ballasts
Lampholders, Starters, and Holders for Fluorescent Lamps
Wired Cabinets

SUBJECT: Report of the Meeting of the Ad Hoc Committee of UL for Commercial Refrigerators and Freezers; Request for Comments on Proposed Requirements for the Sixth Edition of the Standard for Wired Cabinets, UL 65; for the Eighth Edition of the Standard for Commercial Refrigerators and Freezers, UL 471; and for the Ninth Edition of the Standard for Fluorescent-Lamp Ballasts, UL 935; PROPOSED EFFECTIVE DATES

SUMMARY OF TOPICS

The following topics were discussed at the meeting:

1. Introduction – discussion of the method of development and implementation of UL Standards for safety.
2. Ballasts used in commercial display refrigeration equipment and wired cabinets

COMMENTS DUE: August 20, 1997

A meeting of the Ad Hoc Committee of UL for Commercial Refrigerators and Freezers was held at UL's Northbrook office on May 22, 1997. The purpose of the meeting was to discuss issues relating to the use of ballasts in wired cabinets and commercial refrigerators and freezers.

Attached as Appendix A are proposed requirements for UL 935; attached as Appendix B are proposed requirements for UL 471; and attached as Appendix C are proposed requirements for UL 65. Attached as Appendix D is a list of those who attended the meeting. Questions regarding interpretation of requirements should be directed to the responsible UL Staff. Please see Appendix E of this bulletin regarding designated responsibility for the subject product categories.

EXHIBIT A-1

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Subjects 471 (65, 542, 935)

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Please note that proposed requirements are of a tentative and early nature and are for review and comment only. Current requirements are to be used to judge a product until these requirements are published in final form.

PROPOSED EFFECTIVE DATES

The proposed requirements specified in 19.15 in Appendix B, and in 8.7 in Appendix C will necessitate a review of currently Listed, Recognized and Classified products. Therefore, UL proposes that the new requirements become effective 18 months after publication. This is intended to provide ballast manufacturers with sufficient time to submit modified products for investigation and to implement the necessary changes in production. Please note that this also includes the time that will be needed by UL to conduct a review of the modified product.

The remainder of the requirements will not necessitate a review or additional testing of currently Listed, Recognized and Classified products. Therefore, UL proposes that these requirements become effective upon publication.

* * * *

The following report is not intended to be a verbatim transcript of the discussions at the meeting, but is intended to record the significant features of those discussions.

1. INTRODUCTION – DISCUSSION OF THE METHOD OF DEVELOPMENT AND IMPLEMENTATION OF UL STANDARDS FOR SAFETY

DISCUSSION

In opening the meeting, UL briefly described its standards development process and noted that the process provides (1) opportunity for UL to receive suggestions for revisions of its standards and (2) for wide dissemination of proposed requirements so that input may be obtained from all concerned groups. It was emphasized that discussion and comment is sought and encouraged by UL. New or revised UL requirements are implemented for a variety of reasons, including information obtained from field reports, input from authorities having jurisdiction (code groups), forums such as this ad hoc committee, and the like.

UL formed the ad hoc committee to bring together a variety of commercial refrigeration and other experts involved in commercial refrigeration products. The purpose of the meeting was to discuss technical safety issues relating to reports of unintended arcing occurring in fluorescent-lamp circuits, particularly those used in commercial display refrigeration equipment. 9

While UL considers all appropriate available information, it assumes the responsibility for establishing the requirements ultimately adopted in its standards.

The chairman noted that this committee was assembled for the sole purpose of creating interaction between commercial refrigerator manufacturers, ballast manufacturers, and lampholder manufacturers to identify the technical nature of the field reports, and to discuss and consider safety requirements, including initial proposals, that would address the nature of the incidents. Specific product designs were not discussed, however, some companies have developed designs intended to reduce the field incidents. One subject of the meeting was to be sure that the safety requirements took into account actions already taken and successful designs. Further meetings of this committee are not anticipated unless the actions taken as a result of this meeting are not successful. The chairman noted that the ad hoc committee members were assembled to assist UL in the development of appropriate safety requirements. The opportunity to comment as a company representative would occur when proposals are issued. Proposals are issued concurrent with this meeting report.

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2. BALLASTS USED IN COMMERCIAL DISPLAY REFRIGERATION EQUIPMENT AND WIRED CABINETS

DISCUSSION AND RATIONALE

Background – UL stated that at the winter meeting of the Commercial Refrigerator Manufacturers' Association (CRMA) some manufacturers indicated to CRMA that unintended arcing was occurring in fluorescent lampholders and other internal connectors used in commercial display refrigeration equipment. At the meeting, CRMA asked UL to investigate the technical and safety issues relating to such arcing, and it was on this basis that UL formed the ad hoc committee to work toward eliminating the field incidents. In preparation for the ad hoc committee meeting, UL proposed an arcing test for ballasts to be discussed by the ad hoc committee.

General discussion – UL asked the committee members for information relative to ballast/lamp arcing occurrences and causes and related considerations. The related discussion focused on reports relating to occurrences in commercial refrigeration display cases as well as non-refrigerated display cases (wired cabinets). Possible causes for the unintended arcing were considered and fully discussed.

The basic concern is that an arc could occur at a gap in the ballast lamp circuit. The gap can occur as a result of the design, environment or usage. This is because connections may separate (at lampholders or other connectors) and when certain ballast designs (high frequency electronic ballasts in either an instant start or rapid start circuit) are used with certain lamps (T8) and lampholder (bi-pin) designs, the resulting arc at a circuit gap could ignite surrounding combustibles (lampholder insulation, connector insulation, wire insulation or the product in the display case). This had been confirmed in manufacturers' laboratory experiments.

It was noted that the environment of a refrigerated case may be contributory and is considerably different than that which a lighting fixture experiences in a non refrigerated environment. A refrigerated environment includes sources of vibration caused by forces on the display case from the slamming of doors, loading of commodities, and impacts from shopping carts. This environment also includes cool, damp air that may accelerate corrosion of electrical contacts and require higher lamp ignition energies. This environment may cause a fluorescent lamp to loosen in the lampholders or ballast connectors and connections to loosen. Such deterioration can cause an intermittent connection or a circuit gap in the ballast circuit. Except for the colder temperatures, wired cases may have a similar environment.

The trend in ballast usage in the commercial refrigerator product category is to use the ballast that is most efficient (instant start), has lower cost (instant start), and has the fewest connections (instant start), with a reduction in flicker (instant start) and to use larger and longer lamps. The only advantage that rapid start ballasts have is a longer life for the lamp. Other designs with magnetic ballasts and lamp starters are generally no longer being used.

Another trend is to use electronic ballasts with higher frequencies and higher output voltages. Open circuit voltage ratings now exceed 600 V for some ballasts. This voltage is required to start a cold lamp because as the fluorescent lamp temperature gets colder, a higher starting voltage is required.

There was general agreement at the meeting on the following points:

- 1) Electronic ballasts (instant start and rapid start types) can generate arcs at any circuit gap (bi-pin lampholders may be more susceptible to permitting circuit gaps) and this arc can ignite surrounding combustibles. Circuit gaps can occur at connectors or lampholder connections in the ballast lamp circuit due to a variety of conditions that actually occur in the field. These conditions relate to mis-installed lamps, corrosion of live parts, movement of lamps or lampholders, reduction in spring tension of live part connections or terminals, handling of the lamps and the case environment. Vertically installed lamps may also shift due to gravity and (when combined with construction tolerances in the lampholders and products) cause a circuit gap.

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- 2) Ballast output voltage (open circuit voltage) ratings apply to the wiring from the ballast to the lampholder and to the lampholder itself, while the ballast voltage to ground rating (if specified) applies to insulation of other parts (i.e. other nearby wires.) The ballast, if rated over 600 V, employs 1000 V rated wiring and any extension of the wiring including connectors and lampholders should be rated for the voltage output ratings of the ballast (i.e. 1000 V).
- 3) Ballasts may additionally have a voltage to ground rating when the ballast output voltage is greater than 600 V. This rating can be used in the evaluation of the rating of other components near the ballast circuit, such as other wiring in a wiring harness. However, since the ballast output is usually an isolated circuit, the actual voltage to ground depends on the ballast insulation and the product construction. A standard test impedance and test method is required to measure the voltage to ground. The Standard for Fluorescent-Lamp Ballasts, UL 935, contains a method to measure the voltage to ground.
- 4) The lower the temperature (at starting time) and the longer the lamp the higher the voltage required to start the lamp.
- 5) The higher the ballast output frequency the greater the tendency to have a sustained arc. The intent of the ballast is to create an arc, but within the fluorescent lamp. The higher frequencies result in better lamp ignition, efficiency and a reduction in the flicker in the lamps.
- 6) Electronic ballast designs have different resonating circuit structure types (parallel or series) which may be used to reduce the ability of the system to arc under conditions where a gap in the circuit occurs and where the arc may be sustained and start a fire. Other ballast design methods can also be used to limit the arcing capability. However, it was noted that the ballast is designed to create an arc in the lamp.
- 7) Because the present UL 542 standard (Standard for Lampholders, Starters, and Holders for Fluorescent Lamps) limits the voltage rating of fluorescent lampholders to 600 V maximum and Listed ballasts exceed 600 V output ratings, there has been concern among installers, cabinet manufacturers, and UL staff on how to evaluate the combination. If Listed or Recognized lampholders had ratings at higher voltages, for example, up to 1000 V, there would no longer be questions about connections of lampholders. This relates to the UL 542 standard.
- 8) The risk of ignition may be greater in refrigerated display cabinets because of the environment, however, it was reported that there were also field incidents in wired cabinets and in fluorescent lighting fixtures in general. This relates to UL 65, the Standard for Wired Cabinets and to UL 1570, the Standard for Fluorescent Lighting Fixtures.
- 9) For the ad hoc meeting, UL proposed a performance "arcing" evaluation of the ballast-output circuit intended to reduce the possibility of an arc occurring. This was considered to be an acceptable method of testing. The "arcing" test proposed in a May 15, 1997 ad hoc bulletin was slightly modified at the meeting to ensure that the light is illuminated and to define the arc ignition conditions. The proposal is contained in Appendix A. The test is intended to evaluate the ability of the ballast circuit design to limit unintentional arcing.
- 10) There was support to identify ballasts meeting this requirement (Type CR, CC or other appropriate identifier) and to require such ballasts in the UL 471 and UL 65 Standards. However, there was also an opinion that the same requirements should apply to ballasts in general fluorescent lighting fixtures.

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11) There was general support for the proposals to UL 471 and these are included in Appendix B with parallel proposed requirements in UL 65 in Appendix C.

Future activity - UL plans to review the requirements for lampholders to determine whether 1000 V ratings can be included in the UL 542 standard. UL plans to review the comments on this proposal and adopt appropriate requirements.

In conclusion, UL thanked the industry representatives for their time, assistance, and valuable input.

REQUEST FOR COMMENTS ON PROPOSALS

Please provide the following:

1. Your comments concerning the meeting report and the proposed requirements; and
2. Your comments concerning the proposed effective dates, should the proposals be adopted.

Written comments should be sent to the attention of Charles McCall at UL's Northbrook office, 333 Pfingsten Road, Northbrook, IL 60062. Comments may be sent by mail or faxed to (847) 509-6217. Please reference all correspondence to Subject 471.

All comments should be sent by August 20, 1997.

Unless specifically requested to do so, UL will not acknowledge comments indicating concurrence with these proposals.

UNDERWRITERS LABORATORIES INC.



CHARLES McCALL (Ext. 42320)
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REVIEWED BY:



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SR: JTM

471BULL.P01

EXHIBIT A-1

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Subject 935

-A1-

June, 1997

PROPOSED REQUIREMENTS ARE OF A
TENTATIVE AND EARLY NATURE AND
ARE FOR REVIEW AND COMMENT
ONLY. CURRENT REQUIREMENTS ARE
TO BE USED TO JUDGE A PRODUCT
UNTIL THESE REQUIREMENTS ARE
PUBLISHED IN FINAL FORM.

APPENDIX A

PROPOSED REQUIREMENTS AND PROPOSED EFFECTIVE DATE FOR THE NINTH EDITION OF THE STANDARD FOR FLUORESCENT-LAMP BALLASTS, UL 935

Numbered items correspond to the numbered items in the meeting report.

EXHIBIT A-1

2. BALLASTS USED IN COMMERCIAL DISPLAY REFRIGERATION EQUIPMENT AND WIRED CABINETS**RATIONALE**

Ballast and lampholders used in commercial display refrigeration equipment may be subjected to a different environment than a typical lighting fixture. This environment includes sources of vibration caused by forces on the display case from the slamming of doors, loading of commodities, and impacts from shopping carts. This environment also includes cool, damp air that may accelerate corrosion of electrical contacts and require higher lamp ignition energies. This environment may cause a fluorescent lamp to loosen in the lampholders or ballast connectors to loosen. Such deterioration can cause an intermittent connection or a circuit gap in the ballast circuit.

Some electronic ballasts will maintain the voltage with the result that an arc occurs across the circuit gap. The field reports received suggest that while this can happen with lamps powered by conventional magnetic ballasts, the consequence of the interruption will be that the lamp will not light and the ballast will not restart. However, some electronic ballasts will continue to apply the starting voltage, start the lamp, and the high frequency output appears to be able to maintain the lamp current while arcing across the circuit gap continues within a lampholder or other circuit component.

It has been suggested the ballasts have circuitry to detect an abnormal arcing condition and either shut off the ballast or reduce the output power by limiting the current. However, UL staff believes it is not necessary to add the arc detection circuitry to all ballasts at this time. The objective is to develop a performance based test that can be used to show that the ballast will not cause an arc that will ignite nearby combustibles and to require such ballasts in UL 471 applications.

UL proposes an optional arcing performance based test to determine that the ballast will not cause the test material to ignite. Ballasts that have acceptable results can be marked "Type CC" (for commercial cabinet use).

The proposal in UL 935 is being coordinated with a proposal in UL 471 wherein new products would require the ballasts be designated "Type CC" and that replacement ballasts also be designated "Type CC".

UL learned that this occurrence has been reported in wired cabinets and UL is proposing similar requirements for UL 65. (See Appendix C.)

IMPACT

Adoption of the proposals would not require the review of presently Listed or Recognized ballasts. The proposals could be effective upon adoption.

PROPOSAL**(NEW)**

2.2.1 CHEESECLOTH - Used in abnormal condition tests as an indicator of a fire hazard. Bleached cheesecloth is to be 36 inches (910 mm) wide, running 14 - 15 yards per pound (28 - 30 m/kg), and have what is known to the trade as a count of 32 X 28; that is, for any square inch, 32 threads in one direction and 28 threads in the other direction (for any square centimeter, 13 threads in one direction and 11 threads in the other direction).

2.2.1 added (date of publication)

(NEW SECTION)

27A Arcing Test

27A.1 An electronic ballast marked "Type CC" (see 39.5.11) shall be subjected to the test described in 27A.2 – 27A.4 without resulting in a continuous arcing condition that would cause burning or charring of cheesecloth.

27A.1 added (date of publication)

27A.2 The ballast is to be connected as for normal operation except that one lamp is to be disconnected at one end. Additional wiring and a switch are to be added as typically shown in Figure 27A.1. An arcing probe is to be attached at the "free" end of the lamp and the switch, as shown in Figure 27A.1, is to be initially closed. The ballast is to be connected to a source of supply energized at the input voltage and frequency in accordance with 19.7.

27A.2 added (date of publication)

27A.3 The lampholder not connected to the lamp is to be wrapped with a single layer of cheesecloth. The arcing probe is to consist of a 1/8 inch (3.2 mm) diameter brass rod sharpened to a point and embedded in an insulating handle.

27A.3 added (date of publication)

27A.4 After normal operation is established, the switch shown in Figure 27A.1 is to be opened and an attempt made to create an arcing condition by use of the arcing probe. The arcing probe is to be inserted through the layer of cheesecloth and the attempt to create an arcing condition made by continuing lamp current, and then by drawing back the arcing probe in order to create an arcing condition. The attempt at arcing is to continue for 15 minutes, unless it is obvious in less time what the final result will be.

27A.4 added (date of publication)

Figure 27A.1
Arcing test set-up

LAMP CONNECTED TO ONE
LAMPHOLDER

SWITCH INITIALLY
CLOSED

ARCING PROBE

LAMPHOLDER
UNDER TEST

S3982

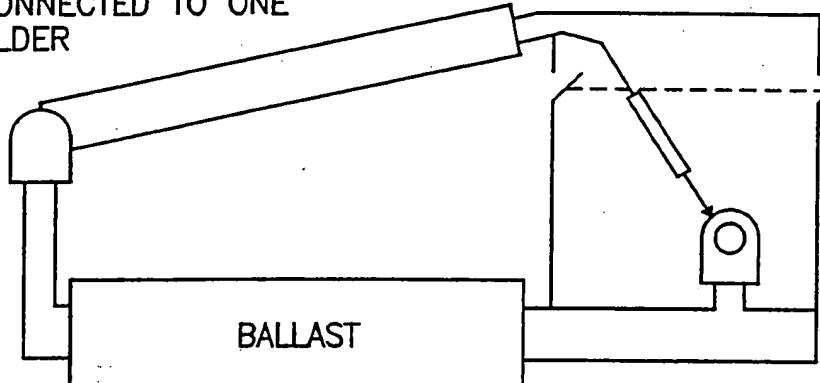


Figure 27A.1 added (date of publication)

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Subject 935

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June, 1997

39 Marking

39.5.11 An electronic ballast intended for commercial cabinets and marked "Type CC" shall comply with the Arcing Test, Section 27A.

39.5.11 added (date of publication)

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Subject 471

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June, 1997

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PUBLISHED IN FINAL FORM.

APPENDIX B

PROPOSED REQUIREMENTS FOR THE EIGHTH EDITION OF THE STANDARD FOR COMMERCIAL REFRIGERATORS AND FREEZERS, UL 471

For your convenience in review, proposed additions to existing requirements are shown underlined and proposed deletions are shown ~~lined-out~~. Proposed new requirements are identified by (NEW). A paragraph that is proposed to be deleted is identified by (DELETED) and is shown ~~lined-out~~.

EXHIBIT A-1

2. BALLASTS USED IN COMMERCIAL DISPLAY REFRIGERATION EQUIPMENT AND WIRED CABINETS

RATIONALE

See Rationale on page A2, Appendix A, except for the rationale for paragraphs 19.12 – 19.14. Paragraphs 19.12 – 19.14 are proposed to be deleted as the requirements are contained elsewhere in the standard.

IMPACT

Except for the requirements proposed in 19.15, the proposed requirements will have no impact on currently Listed or Recognized products. Paragraph 19.15 would require that electronic ballasts be marked (and in effect demonstrate compliance with the proposed arcing test in UL 935 – see Appendix A) "Type CC" by the effective date for UL Listing or Recognition to continue beyond the effective date.

PROPOSAL

11 Separation Of Circuits

11.1 Unless provided with insulation rated for the highest voltage involved, insulated conductors of different circuits, (internal wiring including wires in a wiring compartment) shall be separated by barriers or shall be segregated, and shall in any case, be so separated or segregated from uninsulated live parts connected to different circuits.

Exception: Secondary-circuit wiring of an electric discharge lamp which requires higher voltage wiring based on the output voltage rating marked on the ballast (see 19.4) need not be segregated from wiring with lower voltage rated insulation if the lower voltage rated insulation is greater than the secondary voltage to ground marked on the ballast.

11.1 revised (date of publication)

19 Electronic-Discharge Lighting Systems

19.1 Equipment for use with electric-discharge lighting systems in a refrigerator shall be limited to an open circuit potential of 1000 volts rms or less.

19.1 revised (date of publication)

19.5 Leads wires provided as part of a lampholder are to be considered as having voltage ratings not exceeding the voltage rating of the lampholder, unless a higher voltage rating is printed on the surface of the leads wires.

19.5 revised (date of publication)

(DELETED)

~~19.7 A refrigerator provided with an instant start ballast that involves a potential of more than 300 volts, but not more than 600 volts, shall be provided with:~~

- ~~a) Lampholders of the circuit interrupting type at the low voltage end of the lamps; or~~
- ~~b) Nonshort circuiting type lampholders if the refrigerator is plainly marked [visible during relamping in letters at least 1/8 inch (3.2 mm) in height] to indicate that it is for use with instant start lamps.~~

19.7 deleted (date of publication)

(DELETED)

~~19.8 An electric discharge lighting system shall not contain exposed live parts that may be contacted by persons.~~

19.8 deleted (date of publication)

EXHIBIT A-1

19.9 No uninsulated live part of an electric-discharge lighting system that involves a potential of more than 300 volts shall be accessible:

- a) When the lamps are in place or removed, or
- b) While a lamp is in the process of being inserted or removed.

Exception: This requirement does not apply to an electric lampholder having recessed inaccessible contacts.

19.9 revised (date of publication)

(DELETED)

~~19.10 The terminals of a lamp are considered to be live parts when any terminal of that lamp is in contact with an uninsulated live part involving a potential of more than 300 volts.~~

19.10 deleted (date of publication)

19.11 Compliance with 19.9 will require that it not be possible to insert one end of a bi-pin lamp such that one pin makes electrical contact and the other adjacent pin is accessible, and:

- a) The use of lampholders constructed and wired so that when a lamp is removed, the potential in that lamp circuit is less than 300 volts, or
- b) That the primary circuit is open during the relamping operation and all live parts are inaccessible when a lamp is removed, and the primary circuit is reestablished.

Exception: This requirement does not apply to an electric lampholder having recessed inaccessible contacts intended for use with a lamp having recessed inaccessible contacts.

19.11 revised (date of publication)

(DELETED)

~~19.12 Lampholders and ballasts installed in moist areas, such as within the refrigerated compartment, shall be constructed of moisture resistant materials or treated to resist absorption of moisture.~~

19.12 deleted (date of publication)

(DELETED)

~~19.13 Ballasts shall be provided with a housing of nonflammable, moisture resistant material, except that a reactor type ballast of the open core and coil type without a housing may be used within the enclosure of the refrigerator. An enclosed type ballast having an all metal housing need not be additionally enclosed provided that the housing has the strength and rigidity equivalent to sheet steel not less than 0.026 inch (0.66 mm) thick and is installed in a location where it will not be subject to mechanical damage.~~

19.13 deleted (date of publication)

(DELETED)

~~19.14 A vent opening of a ballast compartment in the form of a slot or louver shall be not more than 3/8 inch (9.5 mm) wide or more than 1 1/2 square inches (9.68 cm²) in area, and any other ventilating opening shall not be more than 1/2 inch (12.7 mm) square. Ventilating openings shall not be located in the top or bottom of a ballast compartment mounted on a vertical surface and shall be located at least 5 inches (127 mm) from surfaces of flammable material, except that openings in a ballast compartment surface perpendicular to or facing away from a flammable surface shall be at least 1/2 inch from such material.~~

19.14 deleted (date of publication)

(NEW)

19.15 Electronic ballasts for use with bi-pin lamps shall be marked "Type CC".

Exception: If the appliance employs recessed bi-pin lampholders, the ballast need not be marked as indicated above.

Added 19.15 effective (18 months after date of publication)

EXHIBIT A-1

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Subject 65

-C1-

June, 1997

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TO BE USED TO JUDGE A PRODUCT
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PUBLISHED IN FINAL FORM.

APPENDIX C

PROPOSED REQUIREMENTS AND PROPOSED EFFECTIVE DATE FOR THE SIXTH EDITION OF THE STANDARD FOR WIRED CABINETS, UL 65

For your convenience in review, proposed additions to existing requirements shown underlined. Proposed new requirements are identified by (NEW). A paragraph that is proposed to be deleted is identified by (DELETED) and is shown lined-out.

Numbers items correspond to the numbered items in the meeting report.

EXHIBIT A-1

COPY

Subject 65

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June, 1997

2. BALLASTS USED IN COMMERCIAL DISPLAY REFRIGERATION EQUIPMENT AND WIRED CABINETS

RATIONALE

See Rationale on page A2, Appendix A, except for the rationale for paragraph 6.3. Paragraph 6.3 is proposed to be deleted as the requirements are contained elsewhere in the standard.

IMPACT

Except for the requirements proposed in 8.7, the proposed requirements will have no impact on currently Listed or Recognized products. Paragraph 8.7 would require that electronic ballasts be marked (and in effect demonstrate compliance with the arcing test in UL 935 – see Appendix A) "Type CC" by the effective date for UL Listing or Recognition to continue beyond the effective date.

(DELETED)

~~6.3 The enclosure for an open-core-and-coil type ballast shall be of sheet steel not less than 0.026 inch (0.66 mm) thick, the seams of which are close fitting. There shall be no open hole other than a 1 inch (25.4 mm) or small diameter opening for an automatic starter.~~

6.3 deleted (date of publication)

8 Electric-Discharge Lamps

8.1 A wired cabinet employing electric-discharge lamps shall be provided with a ballast designed for the operation of lamps of the size for which the cabinet is designed, and shall be wired in accordance with the diagram or instructions on the ballast. Equipment for use with electric-discharge lighting systems in a wired cabinet shall be limited to an open circuit potential of 1000 volts rms or less.

Exception: A construction involving a lamp combination with a ballast that is not intended for such a combination is capable of being used, when the construction is determined to be acceptable by means of a temperature test.

8.1 revised (date of publication)

(NEW)

8.7 Electronic ballasts for use with bi-pin lamps shall be marked "Type CC".

Exception: If the appliance employs recessed bi-pin lampholders, the ballast need not be marked as indicated above.

Added 8.7 effective (18 months after publication)

11.1.2 The voltage rating of the secondary circuit wiring of a wired cabinet employing electric-discharge lamps shall be at least the output-voltage rating (if any) marked on the ballast or ballasts to which it is connected, but not less than 300 volts in any case.

Exception: Secondary-circuit wiring of an electric discharge lamp that requires higher voltage wiring based on the output voltage rating marked on the ballast need not be segregated from wiring with lower voltage rated insulation if the lower voltage rated insulation is greater than the secondary voltage to ground marked on the ballast.

11.1.2 revised (date of publication)

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14 Accessibility of Live Parts

14.1 A wired cabinet that involves a potential of 300 volts or less shall have no live part accessible during intended use to contact by persons, and shall have no uninsulated live parts other than the lamp contacts of screw-shell lampholders accessible when relamping.

Exception: This requirement does not apply to an electric lampholder having recessed, inaccessible contacts.

14.1 revised (date of publication)

(NEW)

14.1.1 Compliance with 14.1 will require that it not be possible to insert one end of a bi-pin lamp such that one pin makes electrical contact and the other adjacent pin is accessible, and:

- a) The use of lampholders constructed and wired so that when a lamp is removed, the potential in that lamp circuit is less than 300 volts, or
- b) That the primary circuit is open during the relamping operation and all live parts are inaccessible when a lamp is removed.

14.1.1 added (date of publication)

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Subject 471 (65, 542, 935)

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June, 1997

APPENDIX D

**ATTENDANCE AT THE MAY 22, 1997 MEETING OF THE
AD HOC COMMITTEE FOR
COMMERCIAL REFRIGERATORS AND FREEZERS**

Industry Representatives

Paul Artwohl	Ardco, Inc.
Terri Betz	Structural Concepts
Andrew Bielski	Motorola Lighting Inc.
Andrew Bobel	Practical Innovations, Inc.
John Burwell	Lyall Assemblies
Kellis Coffman	Robertson Transformer Co.
Charles E. Dwinal	Power Lighting Products, Inc.
Wayne Flaska	Tyler Refrigeration
Greg Gustafson	Zero Zone Inc.
R. Keith Herbert	Kysor/Warren
Bruce Hiermeier	Zero Zone Inc.
Arden Munson	Hussmann
Jerry Prideaux	Power Lighting Products.
Joe Sanders	Frigidaire Commerl. Prods. Co.
Howard Sanders	EMF Corporation
Cheryl Scholz	Hussmann
Taylor Whitehouse	Hill Phoenix
Rob Winsler	Commercial Refrigerator Door Company
Robert Wisbey	Advance Transformer Co.
Harry Zimmerly	Commerical Refrigerator Door Company

UL Staff

Don Grob, Chairman
Megan Cahill
Randy Haseman
Steve Leva
Charles McCall
John Marshall

EXHIBIT A-1

COPY

Subjects 471 (65, 542, 935)

-E1-

June, 1997

APPENDIX E

DESIGNATED RESPONSIBILITY FOR UL PRODUCT CATEGORIES

FKVS, ELECTRIC DISCHARGE LAMP CONTROL EQUIPMENT, FLUORESCENT BALLASTS
FKVS2, ELECTRIC DISCHARGE LAMP CONTROL EQUIPMENT, FLUORESCENT BALLASTS -
COMPONENT
FLPZ, ELECTRIC DISCHARGE LAMP CONTROL EQUIPMENT, HOLDERS FOR AUTOMATIC
STARTERS
FMDX, ELECTRIC DISCHARGE LAMP CONTROL EQUIPMENT, STARTERS, AUTOMATIC
FMDX2, ELECTRIC DISCHARGE LAMP CONTROL EQUIPMENT, STARTERS, AUTOMATIC -
COMPONENT
FMRV, ELECTRIC DISCHARGE LAMP CONTROL EQUIPMENT, STARTERS, MANUAL
FMRV2, ELECTRIC DISCHARGE LAMP CONTROL EQUIPMENT, STARTERS, MANUAL - COMPONENT
FNFT, ELECTRIC DISCHARGE LAMP CONTROL EQUIPMENT, MISCELLANEOUS
FNFT2, ELECTRIC DISCHARGE LAMP CONTROL EQUIPMENT, MISCELLANEOUS - COMPONENT
OKCT, LAMPHOLDERS, 1000V OR LESS
OKCT2, LAMPHOLDERS, (ELECTRIC DISCHARGE) LAMPHOLDERS
SFWY, BEVERAGE COOLERS AND DISPENSERS
SGKW, COMMERCIAL REFRIGERATORS AND FREEZERS
SLKQ2, REFRIGERANT - CONTAINING COMPONENTS, MOTOR-COMPRESSORS, HERMETIC
REFRIGERANT, MARINE
SOSR, REFRIGERATION ACCESSORIES, REFRIGERATION EQUIPMENT ACCESSORIES
SOVQ, REFRIGERATION EQUIPMENT, SPECIAL PURPOSE
SQTV, REFRIGERATION EQUIPMENT, COMMERCIAL WALK-IN UNITS
ZNXR, WIRED CABINETS

The individuals shown in the following tables are involved with the investigation of products covered under the subject categories. The Primary Designated Engineer (shown in UPPERCASE letters) coordinates the establishment and uniform interpretation of UL requirements applicable to the product categories. The Designated Engineers (shown in lowercase letters) work with the Primary Designated Engineer to interpret requirements and maintain standards.

Should you have questions regarding the interpretation of the requirements proposed in this bulletin or any adopted requirements that affect your product, you are encouraged to contact the individual at the office to which you normally submit your products.

The Industry Advisory Conference (IAC) Chairman for the subject categories: SFWY, SGKW, SLKQ2, SOSR, SOVQ, and SQTV is Don Grob at UL's Northbrook office. The Responsible Department Manager for the subject category ZNXR is Wayne Menuz at UL's Santa Clara office. The IAC Chairman for the subject categories: FKVS, FKVS2, FNFT, and FNFT2 is Tom Wollan at UL's RTP office. Tom Wollan is also the Responsible Department Manager for the subject categories: FLPZ, FMDX, FMDX2, FMRV, FMRV2, OKCT, and OKCT2. The IAC Chairman/ Responsible Department Manager oversees the significant interpretations made by the Primary Designated Engineer and arbitrates any differences regarding interpretation of UL requirements.

EXHIBIT A-1

COPY

Subjects 471 (65, 542, 935)

-E3-

June, 1997

CCN	Office/Subsidiary	Responsible Engineer	Extension
OKCT	Melville	ANTHONY TASSONE	22943
	Northbrook	Jeff DesJarlais	43218
	RTP	Edward Grzybowski	11627
	Santa Clara	Kevin Tang	32965
	Hong Kong	C. K. Wong	852-2695-9599
	Taiwan	George Wang	886-2-891-7642

CCN	Office/Subsidiary	Responsible Engineer	Extension
OKCT2	Melville	ANTHONY TASSONE	22943
	Northbrook	Jeff DesJarlais	43218
	RTP	Edward Grzybowski	11627
	Santa Clara	Kevin Tang	32965
	Hong Kong	Michael Chow	852-2695-9599
	Taiwan	George Wang	886-2-891-7642

CCN	Office/Subsidiary	Responsible Engineer	Extension
SFWY SGKW	Camas	Karl Keip	55647
	Melville	Douglas Sickles	22522
	Northbrook	RANDY HASEMAN	43076
	RTP	Carl Radcliffe	11678
	Santa Clara	Barry Karnes	32433

CCN	Office/Subsidiary	Responsible Engineer	Extension
SLKQ2	Melville	Andrew Nelson	22344
	Northbrook	Eric Parent	42939
	RTP	CARL RADCLIFFE	11678
	Santa Clara	Barry Karnes	32433

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SFWY SGKW	Camas	Karl Keip	55647
	Melville	Douglas Sickles	22522
	Northbrook	RANDY HASEMAN	43076
	RTP	Carl Radcliffe	11678
	Santa Clara	Barry Karnes	32433

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SLKQ2	Melville	Andrew Nelson	22344
	Northbrook	Eric Parent	42939
	RTP	CARL RADCLIFFE	11678
	Santa Clara	Barry Karnes	32433

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Subjects 471 (65, 542, 935)

-E4-

June, 1997

CCN	Office/Subsidiary	Responsible Engineer	Extension
SOSR SOVQ	Melville	Douglas Sickles	22522
	Northbrook	RANDY HASEMAN	43076
	RTP	Carl Radcliffe	11678
	Santa Clara	Vinay Panchal	32994

CCN	Office/Subsidiary	Responsible Engineer	Extension
SQTV	Melville	Douglas Sickles	22522
	Northbrook	Randy Haseman	43076
	RTP	ROBERT ROBERSON	11677
	Santa Clara	Barry Kames	32433

CCN	Office/Subsidiary	Responsible Engineer	Extension
ZNXR	Camas	Gene Wirth	55606
	Melville	Peter Manfredonia	22448
	Northbrook	Bruce Bohren	42017
	RTP	Dave Belt	11628
	Santa Clara	MARGARET KIEFER	32312

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